VERSION WITH MARKINGS TO SHOW CHANGES

SPECIFICATION, PAGE 1, LINES 1-27

Clarification of Water and Wastewater

~~**BACKGROUND OF THE INVENTION**~~ **RELATED U.S. APPLICATION DATA**

~~**Field of the Invention**~~

This application claims priority based on US continuation-in-part application, PCT Number US99/18338, U.S. serial number 09/140,203, filed August 12, 1998: and upon US continuation-in-part application serial number 09/343,616 filed on June 30, 1999. Both appliations claim priority based on a parent application, US serial number 08/931,167, filed on September 16, 1997, now abandoned.

Field of the Invention

~~The parent application and the two continuation-in-part applications referenced above are herein incorporated by reference in their entirety. Providing, however: definitions and terminology established herein will govern the meaning of terms herein and below to the extent that there is any inconsistency.~~

~~In the following, the below definitions will be utilized:~~

~~Low molecular weight: 20K - 250K (20 to 250 cps @ 20% active in water and 40 to 1,000 cps @ 50% active in water)~~

~~Medium molecular weight: 500K - 1,000K (500 to 1,000 cps @ 20% active in water and 2,000 to 5,000 cps @ 50% active in water)~~

~~High molecular weight: 1000K - 5,000K (1,000 to 5,000 cps @ 20% active in water and >5,000 cps @ 50% active in water)~~

~~Very high molecular weight: >5,000K (defined by individual intrinsic viscosity)~~

SPECIFICATION, PAGE 2, BETWEEN LINES 2 AND 3

Description of the Related Art

The parent application and the two continuation-in-part applications referenced above are herein incorporated by reference in their entirety. Providing, however: definitions and terminology established herein will govern the meaning of terms herein and below to the extent that there is any inconsistency.

In the following, the below definitions will be utilized:

Low molecular weight: 20K - 250K (20 to 250 cps @ 20% active in water and 40 to 1,000 cps @ 50% active in water)

Medium molecular weight: 500K - 1,000K (500 to 1,000 cps @ 20% active in water and 2,000 to 5,000 cps @ 50% active in water)

High molecular weight: 1000K - 5,000K (1,000 to 5,000 cps @ 20% active in water and >5,000 cps @ 50% active in water)

Very high molecular weight: >5,000K (defined by individual intrinsic viscosity)

SPECIFICATION, PAGE 2, LINES 3 TO PAGE 3, LINE 16

~~Aluminum polymer (AP) is used herein and below to refer to an aluminum polymer or polyaluminum composition such as aluminum chlorohydrate, aluminum hydroxychloride, polyaluminum chloride, polyaluminum hydroxysulfate, polyaluminum hydroxy chlorosulfate, polyaluminum chlorosulfate calcium chloride, a polyaluminum hydroxy "metal" chloride and/or sulfate, or a polyaluminum "metal" chloride and/or sulfate, and the like.~~

~~Medium, high or very high molecular weight AmP (M/H/VHMW AmP) can be medium or high molecular weight DADMAC, medium or high molecular weight Epi-DMA, and medium, high or very high molecular weight amino-methacrylated polyacrylamides. Very high molecular weight DADMAC and Epi-DMA do not exist at this time. Off-the-shelf cationic poyacrylamide is actually a VH MW AmP. It is reasonable to believe that an MMW and HMW polyacrylamide would perform similarly to the respective MMW and HMW DADMAC and Epi-DMA. An H/VH MW AmP should be understood below to include the very high molecular weight polyacrylamides together with the HMW AmP's. Medium molecular weights are included because those of skill in the art will realize, and limited tests indicate, that in some circumstances, in some raw waters, a medium molecular wight AmP will perform equivalently or nearly equivalently to a high molecular weight AmP. That is, the clarification result could meet industry standards.~~

~~The optimal HMW AmP choice in a given circumstance may depend on the chemistry of the waters or wastewater. The combination of AP and AmP may be further enhanced by blending the AP with an aluminum salt (AS). The AmP may be enhanced by blending with other medium, high or very high molecular weight AmP's and/or with low molecular weight quaternized ammonium polymers, such as DADMAC or Epi-DMA.~~

Due to the nature of water chemistry, as it is understood by those knowledgeable in the art, those known as water technologists, successful and optimal coagulants and/or chemical treatments for raw water and equipment combinations can only be determined by testing on the raw water. The industry established test is the jar test. The jar test is a reliable and established method of determining an optimal and successful coagulant and/or chemical treatment when the test has been properly designed to match plant equipment constraints.

The invention herein disclosed is valuable for all raw waters. It should be understood, however, that not all possible individual combinations of AP and AmP (see Figure 9) for various illustrative CV products) would perform equally, optimally and/or as successfully in all raw waters. As individuals have individual fingerprints, raw waters are chemically unique in their respective contaminants, constituents and/or properties. Thus, water technologists know that testing is required to determine optimal and successful blends for different raw water and equipment combination.

The attached blend combinations of the CV 1700 and CV 1900 Series, listed in Figure 9, reveal different combinations for this chemistry. As one tests in different waters and follows the chemical and/or blending guidelines provided by this technology, one may determine other useful combinations that are not listed in Figure 9, yet are optimal and/or successful in a given raw water. These varying species are intended to be covered under the invention as disclosed herein.

Description of the Prior Art

SPECIFICATION, PAGE 13, BETWEEN LINES 1 AND 2

Aluminum polymer (AP) is used herein and below to refer to an aluminum polymer or polyaluminum composition such as aluminum chlorohydrate, aluminum hydroxychloride, polyaluminum chloride, polyaluminum hydroxysulfate, polyaluminum hydroxy chlorosulfate, polyaluminum chlorosulfate calcium chloride, a polyaluminum hydroxy "metal" chloride and/or sulfate, or a polyaluminum "metal" chloride and/or sulfate, and the like.

Medium, high or very high molecular weight AmP (M/H/VH MW AmP) can be medium or high molecular weight DADMAC, medium or high molecular weight Epi-DMA, and medium, high or very high molecular weight amino-methacrylated polyacrylamides. Very high molecular weight DADMAC and Epi-DMA do not exist at this time. Off-the-shelf cationic poyacrylamide is actually a VH MW AmP. It is reasonable to believe that an MMW and HMW polyacrylamide would perform similarly to the respective MMW and HMW DADMAC and Epi-DMA. An H/VH MW AmP should be understood below to include the very high molecular weight polyacrylamides together with the HMW AmP's. Medium molecular weights are included because those of skill in the art will realize, and limited tests indicate, that in some circumstances, in some raw waters, a medium molecular wight AmP will perform equivalently or nearly equivalently to a high molecular weight AmP. That is, the clarification result could meet industry standards.

The optimal HMW AmP choice in a given circumstance may depend on the chemistry of the waters or wastewater. The combination of AP and AmP may be further enhanced by blending the AP with an aluminum salt (AS). The AmP may be enhanced by blending with other medium, high or very high molecular weight AmP's and/or with low molecular weight quaternized ammonium polymers, such as DADMAC or Epi-DMA.

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